Date Received for Clearance Process (MM/YY/DD)
06/30/03

INFORMATION CLEARANCE FORM

A. Information Category

- ☐ Abstract
- ☐ Journal Article
- ☐ Summary
- ☐ Internet
- ☐ Visual Aid
- ☐ Software
- ☐ Full Paper
- ☐ Report
- ☒ Other NOC

B. Document Number DOE/RL-2001-57, Rev. 2

C. Title
Radioactive Air Emissions Notice of Construction for the Transuranic Waste retrieval Project, Rev. 2

D. Internet Address

E. Required Information

1. Is document potentially Classified? ☒ No ☐ Yes (MANDATORY)

R. H. Engelmann
Manager's Signature Required

If Yes _____ ☐ No ☐ Yes Classified
ADC Signature Required

2. References in the Information are Applied Technology ☒ No ☐ Yes
Export Controlled Information ☒ No ☐ Yes

3. Does Information Contain the Following: (MANDATORY)
a. New or Novel (Patentable) Subject Matter? ☒ No ☐ Yes
If "Yes", Disclosure No.: _____
b. Information Received in Confidence, Such as Proprietary and/or Inventions? ☒ No ☐ Yes If "Yes", Affix Appropriate Legends/Notices.
c. Copyrights? ☒ No ☐ Yes If "Yes", Attach Permission.
d. Trademarks? ☐ No ☒ Yes If "Yes", Identify in Document.
4. Is Information requiring submission to OSTI? ☐ No ☒ Yes
5. Release Level? ☒ Public ☐ Limited

F. Complete for a Journal Article

1. Title of Journal

G. Complete for a Presentation

1. Title for Conference or Meeting _____
2. Group Sponsoring _____
3. Date of Conference _____ 4. City/State _____
5. Will Information be Published in Proceedings? ☐ No ☐ Yes 6. Will Material be Handed Out? ☐ No ☐ Yes

H. Author/Requestor
R. E. Johnson 6/30/03
(Print and Sign)

Responsible Manager
R. H. Engelmann 30 June 2003
(Print and Sign)

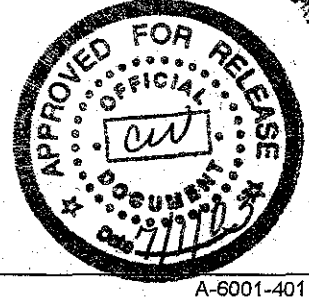
I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒	Leland F. Willis	Leland F. Willis	(Y) / N
Office of External Affairs	☐			Y / N
DOE-RL	☒	Paul Valcich	Paul Valcich	(Y) / N
Other	☐			Y / N
Other	☐			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

- ☐ Applied Technology
- ☐ Personal/Private
- ☐ Proprietary
- ☐ Business-Sensitive
- ☐ Predecisional
- ☐ UCNI
- ☐ Protected CRADA
- ☐ Export Controlled
- ☐ Procurement-Sensitive
- ☐ Patentable
- ☐ Other (Specify) _____

Information Clearance Approval



K. If Additional Comments, Please Attach Separate Sheet

A-6001-401 (12/00)

DOE/RL-2001-57
Revision 2

Radioactive Air Emissions Notice of Construction for the Transuranic Waste Retrieval Project

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Approved for Public Release
(Upon receipt of Clearance approval)
Further Dissemination Unlimited

DOE/RL-2001-57
Revision 2

Radioactive Air Emissions Notice of Construction for the Transuranic Waste Retrieval Project

June 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Chris Willingham 7/1/03
Clearance Approval Date

N/A
Release Approval (stamp)

Approved for Public Release
(Upon receipt of Clearance approval)
Further Dissemination Unlimited

For use with Technical Documents (when appropriate)	
EDC-	FMP-
EDT-	ECN-
Project No.:	Division:
Document Type:	Page Count:

For use with Speeches, Articles, or Presentations (when appropriate)							
Abstract		Summary		Full Paper		Visual Aid	
Conference Name:							
Conference Date:							
Conference Location:							
Conference Sponsor:							
Published in:							
Publication Date:							

CONTENTS

CONTENTS (cont)

FIGURES

TABLES

TERMS

ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
APQ	annual possession quantity
BARCT	best available radionuclide control technology
CFR	Code of Federal Regulations
Ci	curie
cpm	counts per minute
CWC	Central Waste Complex
DOE-RL	U.S. Department of Energy, Richland Operations Office
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
DVS	drum venting system
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
HPT	health physics technician
HSGS	headspace gas sampling
HVU	HEPA-filtered vacuum unit
LIGO	Laser Interferometer Gravitational Wave Observatory
LLBG	Low-Level Burial Grounds
LLW	low-level waste
MEI	maximally exposed individual
mrem	millirem
NOC	notice of construction
PCM	periodic confirmatory measurements
PTE	potential-to-emit
SEPA	*State Environmental Policy Act of 1971*
TEDE	total effective dose equivalent
TRU	transuranic (waste)
TSD	treatment, storage, and/or disposal
WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1990, Professional Publications, Inc., Belmont, California.

NOTICE OF CONSTRUCTION HISTORY

The *Radioactive Air Emissions Notice of Construction for the Transuranic Waste Retrieval Project*, Revision 1, was submitted to the Washington State Department of Health (WDOH) and the U.S. Environmental Protection Agency (EPA), Region 10, on December 18, 2001 (02-RCA-096).

Revision 1 dealt with transuranic (TRU) waste containers that were drums only. Retrieval of TRU waste boxes was deferred to a later approval. This revision addresses retrieval of TRU boxes and other containerized waste in addition to the drums addressed by Revision 1. In addition, this revision updates the process description and controls for soil removal related to retrieval.

Venting of containers is further discussed in terms of constructing a new point source for emissions, an enclosure used to enhance occupational work conditions and control potential emissions. Diffuse and fugitive emissions are also addressed, in which case NucFil® filters and/or sample ports are installed by a proven system minimizing the risk of contamination release. In addition, this revision includes some description of low-level waste (LLW) management and describes operations involving headspace gas sampling (HSGS) and NucFil filter and/or sample port installation/replacement. These HSGS and filter replacement activities could be or currently are performed at other Hanford Site treatment, storage, and/or disposal (TSD) units, i.e., T Plant, the Central Waste Complex (CWC), or the Waste Receiving and Processing Facility (WRAP).

NucFil® is a registered trademark of Nuclear Filter Technology, Inc., Lakewood, Colorado.

This page intentionally left blank.

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR THE TRANSURANIC WASTE RETRIEVAL PROJECT

This revision serves as a notice of construction (NOC) pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct pursuant to 40 Code of Federal Regulations (CFR) 61.07, for retrieving and handling of containers of TRU and suspect-TRU waste currently buried at the Low-Level Burial Grounds (LLBG).

Since 1970, approximately 38,000 suspect-TRU and TRU waste containers have been placed in retrievable storage on the Hanford Site in the 200 Areas burial grounds. The majority of TRU waste containers on the Hanford Site (estimated to be approximately 28,000) are located in outdoor trenches in the LLBG, in which the containers had been stacked upright on asphalt pads and then covered with earth (Figure 3).

The major activity under the TRU waste retrieval project is to retrieve and handle TRU waste stored in containers at the LLBG as described in *Process Description for the Retrieval of Earth Covered TRU Waste Containers at the Hanford Site* (HNF-5597). These containers will be retrieved, visually inspected for structural integrity, and, if necessary, placed in an overpack container during the retrieval phase. Waste will be categorized as TRU (including mixed waste) or LLW (including mixed waste) through a records review or nondestructive assay. Unvented containers containing TRU material will be vented (either within the LLBG as proposed, or at another TSD unit approved for such work). Inadequately vented TRU containers (i.e., vent clips or plugged filters) could also be vented. Retrieved TRU containers will be transported from the LLBG to an existing TSD unit (Containers for which there is no disposition pathway will be left in the LLBG). The TSD unit for this operation is expected to be the CWC; however, the WRAP Facility and T Plant Complex also could be used to manage specific container issues before acceptance at CWC. At CWC, the containers will be stored for certification activities to support disposal at the Waste Isolation Pilot Plant (WIPP). The containers determined to be LLW will be disposed in the LLBG or transferred to another TSD unit or other approved facility. A small percentage of TRU waste containers is expected to require special handling (described further in Section 5.0).

This NOC is intended to cover the excavation activities associated with retrieval of waste containers as well as activities associated with assaying containers and installing NucFil filters or equivalent in the retrieved containers lacking proper venting devices.

Section 15.0 of this NOC discusses the estimated total effective dose equivalent (TEDE) to the offsite maximally exposed individual (MEI) resulting from the unabated and abated emissions from these new activities.

The public maximally exposed individual (MEI) location with respect to the 200 East Area is located at Energy Northwest (commercial power production facility on the Hanford Site) and with respect to the 200 West Area is located at the Laser Interferometer Gravitational Wave Observatory (LIGO). The unit dose conversion factors (HNF-3602), using the CAP88 PC computer model with Hanford Site specific default values, were used to calculate the potential TEDE to the MEI. The MEI location at LIGO is more restrictive than the MEI location at Energy Northwest. Therefore, the MEI location for the LLBG is considered LIGO, regardless of whether activities take place in 200 East Area or 200 West Area.

1.0 LOCATION

Name and address of the facility, and location (latitude and longitude) of the emission unit(s).

The LLBG are located in the 200 West and 200 East Areas (Figure 1). The address and representative geodetic coordinates for the LLBG (representing 200 West LLBG, adjacent 200 West TSD facilities, and including activities at 200 East LLBG) are:

U.S. Department of Energy, Richland Operations Office (DOE-RL)
Hanford Site
Richland, Washington 99352
200 West Area

46° 34' North Latitude
119° 38' West Longitude.

2.0 RESPONSIBLE MANAGER

Name, title, address, and phone number of the responsible manager.

Matthew S. McCormick
Assistant Manager for the Central Plateau
U.S. Department of Energy, Richland Operations Office
P. O. Box 550
Richland, Washington 99352
(509) 373-9971.

3.0 PROPOSED ACTION

Identify the type of proposed action for which this application is submitted.
a. Construction of new emission unit(s), or
b. Modification of existing emission unit(s); identify whether this is a significant modification.

The proposed action is to retrieve (unearth) and inspect containers of suspect-TRU and TRU waste from trenches in the LLBG and install NucFil filters or equivalent in the unvented (or inadequately vented) TRU containers. Venting and HSGS could be performed at the LLBG (in place with engineering controls or within venting enclosure) or at another TSD unit already approved for such work (CWC, WRAP, or T Plant Complex). In addition, LLW containers posing a safety hazard (e.g., potential for pressurization, bulging, or similar abnormal condition) could also be vented. As such, a modified (insignificant) source for diffuse and fugitive emissions and a new portable point source for emissions will be created.

4.0 STATE ENVIRONMENTAL POLICY ACT

If this project is subject to the requirements of the State Environmental Policy Act (SEPA) contained in chapter 197-11 WAC, provide the name of the lead agency, lead agency contact person, and their phone number.

The proposed action categorically is exempt from the requirements of SEPA under WAC 197-11-845.

5.0 PROCESS DESCRIPTION

Describe the chemical and physical processes upstream of the emission unit(s).

A description of the retrieval activities is provided in the following sections. These activities are summarized in a simplified process flow diagram in Figure 2.

5.1 Excavation and Retrieval of Containers

The area to be excavated is managed as a 'clean' area, free of surface contamination measurable with field survey instruments. Because of the possibility of encountering previously undetected subsurface contamination, or future contamination from windblown sources, all work will be performed in accordance with as low as reasonably achievable (ALARA) requirements as determined by the Radiological Control organization. These requirements are carried out through the activity work packages and associated radiological work permits (RWP).

The overburden soil will be removed to expose the waste containers. Excavation equipment will be chosen to effectively remove soil and retrieve the waste containers while minimizing damage to the containers. Excavation activities will be monitored to identify contamination that might be present and to minimize emissions. Any contaminated soils will be managed in accordance with applicable requirements and regulations.

The most efficient methodology for removing the uncontaminated overburden from the containers will include the maximum use of conventional methods such as backhoes, frontend loaders, mechanical brooms (boom mounted), or manual digging with shovels and similar hand tools. Hand tools predominantly will be used to excavate contaminated soil. High-efficiency particulate air (HEPA) filtered vacuums could be used for spot contamination in accordance with the HEPA-filtered vacuum unit (HVU) NOC (DOE/RL-97-50, as amended).

The typical storage configuration of retrievably stored TRU waste is depicted in Figure 3. The specific steps or approach to uncovering the containers will vary according to the configuration of the trench to be uncovered, the nearby trenches or fences, the designated location of the spoils pile, the planned extent of the soil removal, etc. Therefore, excavation activities will be planned before arriving at the job site. Excavation activities will be controlled closely. When the quantity of soil removed with heavy equipment has reached the logical end, hand tools or HVUs could be used to complete the uncontaminated soil removal operations to access and remove the plastic and plywood materials (to be set aside for reuse or disposal) covering the containers.

The exposed containers will be visually inspected and surveyed for contamination. Abnormal drum conditions will be managed as follow: Contaminated containers will be decontaminated or overpacked as needed. Bulging or potentially pressurized containers will be vented as described in Section 5.2. Retrieval activities will include appropriate disposition of small amounts of incidental contaminated soil (e.g., containerized or fixed in place). Larger areas of contamination could be fixed and the area posted as required by the Radiological Control organization for later disposition. Bulk transfer of contaminated soils for disposal in another trench also could occur.

All containers will be inspected to verify integrity. The container inspection will consist of a visual examination to determine if there are significant corrosion, holes, dents or other visual deformities. All containers could be moved, turned, or otherwise relocated (manually or with powered equipment, slings, clamps, or appropriate rigging) to facilitate an adequate visual inspection.

Overpacking containers with minor defects (pinholes, corrosion) is routinely performed at the LLBG and CWC and is expected for up to 10 to 50 percent of the retrieved containers. Precautions will be provided to safely retrieve containers of questionable integrity (abnormal conditions, described further in Sections 6.1, 10.3, and 13.3). The process description for management of abnormal containers will be maintained in written procedures. Operating procedures will be established to safely deal with these containers. Containers that obviously are breached or deformed also will be safely removed. Removal methods will be determined on a case-by-case basis. A breached container that can provide secure confinement will be relocated to an area for repackaging or overpacking. If the container cannot provide adequate confinement for the contents, the container and contents will be overpacked before being relocated. The overpacked containers will be managed according to the LLW (including mixed waste) or TRU waste designation (TRU containers are those with TRU content greater than 100 nCi/g), established by records or assay.

After a container is inspected visually and the structural integrity established, the container (if shown by assay or records to be designated as TRU) will be staged for venting, if necessary, or moved to another TSD unit for venting. Retrieved TRU waste containers in their staged configuration at the LLBG will be inspected for outwardly visible signs of corrosion or degradation (overpacking as needed).

5.2 Venting of Containers

All work will be performed in accordance with the LLBG radiological control procedures and ALARA requirements. These requirements are carried out through the procedures, activity work packages, and associated RWPs.

The vent filters will be installed in designated containers via a proven process [Drum Venting System (DVS) and/or Dart System] that ensures personnel and environmental protection. The methodology will require penetrating the container and inserting a vent. Penetration of the lid will be accomplished by either drilling through the lid with a filter assembly fitted with a short hollow drill bit (using DVS) or puncturing the lid with a filter dart (using Dart system). Either method will result in emissions being routed through a filter during the venting process.

Most drums slated for venting will be vented with the DVS (Figure 4), consisting of a trailer with a chamber allowing an operator to sample the drum (screening HSGS for hydrogen content) and install a NucFil filter. Potential emissions from these operations are point source emissions, controlled as described in Section 6.2.

Bulging or potentially pressurized drums will be evaluated to determine best method and location to vent (Dart-in place, Dart-relocate, or move to the DVS). The Dart System is a portable unit that straps directly onto a drum, using a pneumatic driver remotely activated by wire or radio transmitter. This system penetrates the drum lid without risk of contamination release to install a NucFil filter with an aluminum bronze housing to prevent the possibility of sparking. Potential emissions from these operations will be considered diffuse and fugitive. The same Dart System will be used to install sample ports, consisting of a closure set screw covering a septum for withdrawing a sample for HSGS, in containers with existing vents at the LLBG, CWC, WRAP, or T Plant Complex, without creating a new pathway for potential emissions.

The NucFil venting/sample port installation technology (both cold drilling and dart insertion approaches) is well proven, having been used successfully across the DOE complex and commercial nuclear and chemical industry to install vents and/or sample ports in hundreds of thousands of drums and other containers.

6.0 PROPOSED CONTROLS

Describe the existing and proposed (as applicable) abatement technology. Describe the basis for the use of the proposed system. Include expected efficiency of each control device, and the annual average volumetric flow rate(s) in meters^3/sec for the emission unit(s).

Many of the emission controls used for the diffuse and fugitive emissions during the TRU waste retrieval activities will be administrative, based on ALARA principles and consist of ALARA techniques. It is proposed that these controls as described below be approved as best available radionuclide control technology (BARCT) for retrieval and venting of suspect-TRU waste containers.

6.1 Excavation and Retrieval of Containers

Health physics technician (HPT) coverage will be provided during the excavation activities, continuously when in close proximity to containers. Soil surveys for radioactive contamination will be performed for alpha and/or beta/gamma. Appropriate controls such as water, fixatives, covers, or windscreens will be applied, if needed, as determined by the Radiological Control organization. Spoil piles containing contaminated soil will be segregated from the clean soil. Containerizing spoils for disposal also could be performed. Operational limitations (windspeed) for TRU retrieval activities will be by LLBG operating methods, procedures, and/or work packages.

Manual methods described in Section 5.1 will be used to excavate soil in close proximity to containers (after overburden is removed). Operational limits for TRU retrieval (contamination levels) will be established in the activity work packages and associated RWPs. Fixatives or other controls will be employed if contamination levels (other than spot contamination) exceed 100,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) beta-gamma or exceed 2,000 dpm/100 cm^2 alpha. Excavation activities will be stopped if contamination (other than spot contamination) with detection readings greater than 500,000 dpm/100 cm^2 beta-gamma or greater than 28,000 dpm/100 cm^2 alpha is encountered. Excavation will not continue at that site (but may proceed at other sites) until a review of the work and encountered conditions has been performed and a determination has been made that no threat to personnel safety or the environment exists, or until proper controls (i.e., removal and disposal, water, fixatives, or covers) have been put in place to mitigate any further potential for emissions; and the WDOH has been contacted and briefed of the situation. WDOH will also be contacted if a loss of containment occurs (dropping, spilling, puncturing a container, or otherwise encountering loss of integrity where contamination escapes containment), which exceeds 100,000 dpm/100 cm^2 beta-gamma or 2,000 dpm/100 cm^2 alpha removable contamination. WDOH will be notified per WAC 246-247-080(5) if the number of such incidents exceeds the 25 containers per year accounted for in calculations described in Section 13.3.

Use of HVUs for control of localized spot contamination will be done in accordance with the HVU NOC (DOE-RL-97-50, as amended).

6.2 Venting of Containers

Container surface surveys/smears for radioactive contamination will be performed for alpha and/or beta/gamma during the inspection/retrieval activities and before transfer to a TSD. HPT coverage will be provided during the venting activities.

The DVS has a testable HEPA-type filter for all emissions resulting from screening HSGS for hydrogen content and NucFil filter installation. Metal filings or other residual cuttings from the drilling/filter installation process are removed from the drum lid with a HEPA vacuum. The test compartment is passively ventilated with a HEPA-type filter and is designed to withstand a deflagration as described in the performance specification for this venting system (HNF-12180).

The average annual flow for the exhaust port for the venting and HSGS operations shown in Figure 4 is approximately 1 E-4 m^3/s (consisting of a continuous flow in the milliliter per second range, with intermittent spikes in the liter per second range). The HEPA vacuum exhausts intermittently into the test chamber (at less than 300 cfm, or 1.4 E-1 m^3/s). The test chamber shown in Figure 4 is passively vented.

The Dart System is designed to insert a non-sparking NucFil filter or sample port remotely and nearly instantaneously (insertion time in milliseconds), even if the container is pressurized. Containers that already have NucFil filters installed may have NucFil sample ports installed (allowing subsequent HSGS collection) without creating a new pathway for potential emissions. Sample ports may be installed in drums with existing NucFil filters using the Dart System at the LLBG, CWC, WRAP, or T Plant Complex.

The HEPA-type NucFil filters are not testable once installed, but are certified by the manufacturer as HEPA rated (99.97 % removal efficiency, flow rate in the range of 1 E-6 to 3 E-6 m^3/s).

7.0 DRAWINGS OF CONTROLS

Provide conceptual drawings showing all applicable control technology components from the point of entry of radionuclides into the vapor space to release to the environment.

Drawings of controls for the diffuse and fugitive emissions are not applicable because the emission controls to be used during these activities are defined administratively, based on ALARA principles and consist of ALARA techniques. A schematic of the DVS is provided in Figure 4. More detailed information on the NucFil equipment (considered proprietary) will be provided as supplemental information to WDOH when it becomes available.

8.0 RADIONUCLIDES OF CONCERN

Identify each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI.

The radionuclides of concern exist as particulates. All radionuclides are assumed to be conservatively represented by either americium-241 or cesium-137. This assumption provides a conservative estimate of the potential-to-emit (PTE) from the vented containers. Radionuclides that could contribute greater than ten percent of the PTE include strontium-90, cesium-137, plutonium 239/240, and americium-241, but are conservatively represented by cesium-137 and americium-241. Other radionuclides expected to be encountered are cesium-134, europium-152, europium-154, uranium-234, uranium-235, uranium-236,

uranium-238, plutonium-238, plutonium-241, americium-243, curium-244, and californium-252. Any radionuclide isotope could be encountered.

9.0 MONITORING

Describe the effluent monitoring system for the proposed control system. Describe each piece of monitoring equipment and its monitoring capability, including detection limits, for each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI, or greater than twenty-five percent of the TEDE to the MEI, after controls. Describe the method for monitoring or calculating those radionuclide emissions. Describe the method with detail sufficient to demonstrate compliance with the applicable requirements.

The potential unabated offsite dose associated with this activity for normal operations is calculated to be less than 0.1 millirem per year. Therefore, in accordance with 40 CFR 61, Subpart H, periodic confirmatory measurements (PCM) will be made to verify the low emissions. The potential unabated offsite dose associated with this activity for encountering and handling deteriorated containers (up to 25 containers involved with loss of containment as described in Section 13.3) is calculated to be less than 1 millirem per year. The 200 Area Diffuse/Fugitive emission unit (which includes the LLBG) is considered by WDOH as a major, non-point emission source. The existing 200 Area network system for near-field monitoring (DOE/RL-91-50) will be used to verify low emissions during TRU waste retrieval.

Additional monitoring for the diffuse and fugitive emissions will consist of radiological surveys from the soil excavation activities. The survey methods for monitoring are not a direct measurement of effluent emissions. The methods are intended to demonstrate compliance by showing that by being under the contamination levels by which work is controlled, the actual emissions inherently would be below the estimated emissions, which are based on (calculated from) the same contamination levels.

HVUs used for spot contamination or cleaning tops of drums will use logsheets and monitoring (smears and surveys) in accordance with the NOC for these units (DOE/RL-97-50, as amended). The HVU used inside the DVS is exempt from the HVU NOC requirements.

Smears of the active exhaust port of the DVS will be performed after each day of use to verify low emissions from point sources. Smears of the passive port will be performed on a weekly basis while in use to verify low emissions.

10.0 ANNUAL POSSESSION QUANTITY

Indicate the annual possession quantity for each radionuclide.

The annual possession quantity (APQ) and annual handling limits are discussed in the following sections. The APQ is provided strictly as the basis for a conservative estimate of the PTE, not a limit.

It is conservatively estimated that the average amount of radionuclides in any one container (drum equivalent) will not exceed 20 curies (DOE/RL-2000-34, Rev. 1). It further is estimated that the alpha emitters would make up approximately 1.25 curies and the beta/gamma emitters would make up approximately 18.75 curies on average in any container. A maximum of 20,000 containers (drum equivalents) will be managed per year at the LLBG under this TRU retrieval NOC for an estimated APQ of 25,000 curies (Ci) of alpha and 375,000 Ci of beta/gamma.

10.1 Staging and Handling of Retrieved Containers

An estimated maximum of 10,000 containers of TRU waste will be retrieved during the peak year of this project. TRU waste containers are considered retrieved when transferred to CWC. An additional 10,000 containers (drum equivalents) that are not designated as TRU waste could be relocated or retrieved as well. Of these, 9,000 are estimated as LLW containers that are not vented (although not technically meeting the definition of 'sealed' containers, WDOH has recognized them as closed containers such that potential emissions from these non-vented containers need not be addressed). The remaining estimated 1,000 containers are non-TRU containers that are already vented or are will be vented at the LLBG. Thus, a total of 11,000 vented containers are used for calculating release rates in Section 13.1 for staging and handling operations for vented containers.

10.2 Venting of Containers

It is estimated that a maximum of 9,000 containers of TRU waste will require installation of venting devices each year using the DVS. An additional 1,000 containers could require installation of NucFil filters using the Dart System. Either system could be used for containers that use the older vent clips or appear to be plugged. In addition, up to 10,000 NucFil sample ports could be installed using the Dart System in containers that already have NucFil filters. This would occur in the 200 West Area (LLBG, CWC, WRAP, or T Plant Complex). Thus, a total of 9,000 vented containers are used for calculating release rates in Section 13.2 for point source emissions and 1,000 vented containers for diffuse and fugitive emissions from venting operations. Installation of sample ports in already vented containers does not create a new pathway for potential emissions under normal operations.

10.3 Excavation and Retrieval of Containers

Trenches configured as shown in Figure 3 are not expected to have contaminated soil in contact with the drums. However, up to an estimated 25 containers per year are assumed to be involved in a loss of containment (as described in Section 6.1) to calculate release rates in Section 13.3 for excavation activities.

In addition, one trench configuration had drums placed horizontally in a V-notched trench, with soil used to fill the void spaces between containers, which deserves special consideration. Although retrieval from this particular trench configuration is not planned in the near future, it does provide a bounding estimate for encountering contaminated soil as follows. A maximum of 2,500 containers of TRU waste per year would be retrieved from the horizontal trenches (included in the totals for Sections 13.1 and 13.2). These containers have been in direct contact with soil. An estimated 1,000 m^3/year of soil overburden above these 2,500 containers would be removed that has not been in contact with the TRU waste containers, which is considered clean overburden with minimal potential for contamination. The volume occupied by 2,500 containers (drum equivalent) is approximately 500 m^3. An estimated 100 m^3 of soil occupies the void spaces between the containers. The integrity of the containers is expected to be quite good (HNF-3580; HNF-7165). A conservatively estimated 100 m^3 of the soil in contact with the containers is assumed to be contaminated at detectable levels (100 dpm/100 cm^2 TRU and 5,000 dpm/100^2 cm beta direct readings). A smaller percentage, 10% of the contaminated soil (i.e., 10 m^3), is assumed to be contaminated at higher levels (2,000 dpm/100 cm^2 alpha and 100,000 dpm/100 cm^2 beta). Contamination at the notification levels is not expected. However, as a contingency planning estimate, 1% of the contaminated soil (i.e., 1 m^3) is assumed to be contaminated at notification levels (28,000 dpm/100 cm^2 alpha and 500,000 dpm/100 cm^2 beta). These volumes and contamination levels are used in Section 13.3 to calculate release rates from the horizontal trench operations.

In addition HVUs could be used for both uncontaminated soils (tops of drums or tarps) using collection drums. Spot contamination and small areas of contamination on tops of drums or on the asphalt pads could be collected using HVUs in accordance with the HVU NOC (DOE/RL-97-50, as amended). Release rates from HVU operations are calculated in Section 13.3 by assuming 0.1% of the soil contamination estimated for manual excavation is collected using HVUs.

11.0 PHYSICAL FORM

Indicate the physical form of each radionuclide in inventory: Solid, particulate solids, liquid, or gas.

The physical form of the radionuclides is particulate solid. Although none is expected, a negligible fraction of gaseous or liquid radionuclides could be encountered in the TRU waste retrieval project; however, if encountered, it would not provide a numeric change to the estimate of total curies.

12.0 RELEASE FORM

Indicate the release form of each radionuclide in inventory: Particulate solids, vapor, or gas. Give the chemical form and ICRP 30 solubility class, if known.

The release form of the radionuclides is particulate solid. Although none is expected, a negligible fraction of gaseous radionuclides could be encountered in the TRU waste retrieval project; however, if encountered, it would not provide a numeric change to the estimate of total curies.

13.0 RELEASE RATES

Release Rates: a. New emission unit(s): Give predicted release rates without any emission control equipment (the potential-to-emit) and with the proposed control equipment using the efficiencies described in subsection (6) of this section, or b. Modified emission units(s): Give predicted release rates without any emissions control equipment (the potential-to-emit) and with the existing and proposed control equipment using the efficiencies described in subsection (6) of this section. Provide the latest year's emissions data or emissions estimates.

The TEDE to the Hanford Site MEI from all calendar year 2001 U.S. DOE Hanford Site air emissions (point sources and diffuse and fugitive sources) was 0.49 millirem (DOE/RL-2002-20). The emissions resulting from the activities covered by this NOC, in conjunction with other operations on the Hanford Site, will not result in exceeding the National Emission Standard of 10 millirem per year (40 CFR 62, Subpart H).

Release rates resulting from the retrieval and venting activities are expected to be low and are described in the following sections.

13.1 Staging of Retrieved Containers

A maximum of 11,000 vented containers of waste (including 1,000 containers that are not designated as TRU waste, which could be retrieved with vents in place) will be retrieved per year. Once vented, the containers will be staged with the other retrieved containers for further handling, resulting in the staging/storage of a maximum of 11,000 vented containers per year at the LLBG. Using an average release fraction of 2.00 E-09 for fugitive emissions from vented containers (as used in the WRAP NOC,

DOE/RL-2000-34), the potential unabated release rate from the staging of vented containers is 2.8 E-05 Ci/yr americium-241 and 4.1 E-04 Ci/yr cesium-137 as shown in Table 1. No credit is taken for abatement; therefore, the abated emissions are assumed as the unabated emissions.

13.2 Installation of Drum Vents

A maximum of 9,000 containers of TRU waste will be processed per year using the DVS. The processing rate is designed to be 3 to 6 drums per hour, or a maximum time of 20 minutes per drum. Only one drum is processed at a time per DVS unit (although only one unit is planned, a second unit could be acquired to achieve processing rates of 9,000 containers per year). Using a release fraction of 1.0 E-3 for particulates and a time factor of 1.9 E-1 (20 minutes per container multiplied by 9,000 containers and divided by 526,000 minutes per year), the potential unabated release rate from using the DVS is 4.3 E-4 Ci/yr americium-241 and 6.4 E-3 Ci/yr cesium-137 as shown in Table 1. The DVS has a testable HEPA rated filter (99.95% removal efficiency, tested annually); therefore, the abated release rate is 2.1 E-7 Ci/yr americium-241 and 3.2 E-6 Ci/yr cesium-137, as shown in Table 1. The time factor is very conservative, as the actual HSGS screening process takes place in 30 to 40 seconds. The remainder of the time is spent on purging the sample lines and detectors with inert gases and setting up for the next container. The venting system is functionally equivalent in purpose, capabilities, and release rates as the modular containment at CWC approved for sampling activities up to 10,000 containers per year in support of WIPP certification.

The passive vent of the DVS exhausts potential emissions from using the HVU mounted in the test chamber to collect metal filings after installation of a NucFil filter. In accordance with the HVU NOC (DOE/RL-97-50, as amended), release rates are calculated by multiplying surface area vacuumed by the contamination level. Very few incidents of contamination have been encountered during the DVS use at other DOE sites. A very conservative estimate of release rates is calculated by assuming the surface area of the boot that covers the drum lid during the filter installation process (8.3 square inches) multiplied by 9,000 drums with an average contamination level of 10,000 dpm/100 cm^2 beta/gamma and 200 dpm/100 cm^2 alpha. Using a release fraction of 1.0 for HVU use, the potential unabated release rate from using the DVS is 4.3 E-7 Ci/yr americium-241 and 2.2 E-05 Ci/yr cesium-137 as shown in Table 1. The passive vent of the DVS has a testable HEPA rated filter (99.95% removal efficiency, tested annually); therefore, the abated release rate is 2.2 E-10 Ci/yr americium-241 and 1.1 E-8 Ci/yr cesium-137, as shown in Table 1.

A maximum of 1,000 containers will have installation of NucFil filters using the Dart System. This nearly instantaneous filter/sample port insertion system installs a NucFil filter in milliseconds. A conservative time estimate for pressure release during each installation is 1 hour. Using a release fraction of 1.0 E-3 for particulates and a time factor of 1.1 E-1 (60 minutes per container multiplied by 1,000 containers and divided by 526,000 minutes per year), the potential unabated release rate from using the Dart System for installation of NucFil filters is 1.4 E-4 Ci/yr americium-241 and 2.1 E-3 Ci/yr cesium-137 as shown in Table 1. All of the emissions from a pressurized container are routed through the HEPA-type NucFil filter (certified 99.97% removal efficiency); therefore, the abated release rate is 4.8 E-8 Ci/yr americium-241 and 7.1 E-7 Ci/yr cesium-137, as shown in Table 1.

13.3 Excavation and Retrieval of Containers

Although the exact condition of the waste containers is not known, there are indications from studies that indicate a high level of integrity for drums (HNF-3580; HNF-7165). Encountering contamination is not expected during excavation; therefore, to determine a potential to emit if contamination is encountered, the administrative control points set in Section 6.1 for contamination, as monitored by standard

radiological field instrumentation, will be used to bound emissions. The 500,000 dpm/100 cm^2 beta/gamma control point correlates to 50,000 counts per minute (cpm) as used in the calculations, and 28,000 dpm/100 cm^2 above background alpha correlates to 4,000 cpm. To determine the corresponding soil concentration in picocuries per grams of individual radionuclides, conversion factors, as developed in *Soil Contamination Standards for Protection of Personnel* (HNF-2418) were used. The average soil density was assumed to be 98 pounds per cubic foot. The beta-gamma contributing radionuclides were assumed to be represented by Cs-137 and the alpha contributing radionuclides were assumed to be represented by Am-241 (predominant alpha contributing radionuclide in the soil is unknown; therefore, assumption of Am-241 will produce the most conservative dose consequence). The respective volumes of contaminated soil (i.e., 100 m^3, 10 m^3, and 1 m^3) at the three contamination levels described in Section 10.3 are considered as released from manual excavation, using a release fraction of 1.0 E-3.

The potential unabated release rate from manual excavation is 1.9 E-4 Ci/yr americium-241 and 1.3 E-3 Ci/yr cesium-137 as shown in Table 1. As described in Section 6.1, fixatives and similar controls would be employed for the higher contamination level and notification level contamination providing abatement of at least a factor of 10; therefore, the abated release rate is 4.9 E-5 Ci/yr americium-241 and 3.3 E-4 Ci/yr cesium-137, as shown in Table 1.

HVU use as described in Section 10.3 is assumed as 1 % of the total unabated release rates for manual excavation, but a release fraction of 1.0 is used instead of the 1 E-3 release fraction used for manual excavation. This yields a potential unabated release rate of 1.9 E-3 Ci/yr americium-241 and 1.3 E-2 Ci/yr cesium-137 as shown in Table 1. HVUs are tested at 99.95% removal efficiency; therefore, the abated release rate is 9.7 E-7 Ci/yr americium-241 and 6.4 E-6 Ci/yr cesium-137, as shown in Table 1

The release rates discussed thus far do not address encountering deteriorated containers involving a loss of containment from handling/retrieval of such containers (dropping, spilling, puncturing or crushing a container, where containment is lost, or otherwise encountering loss of containment). Although such conditions are not expected in normal operations, the probability that they would occur at some point is likely greater than 1%. To account for such incidents, it is assumed that up to 25 containers (drum equivalent) will have some loss of containment during a given year. Using a release fraction of 1.0 E-3 for particulates, the potential unabated release rate from loss of container integrity is 3.1 E-2 Ci/yr americium-241 and 4.7 E-1 Ci/yr cesium-137 as shown in Table 1. Fixatives and similar controls that would be employed for these potential incidents would provide abatement of at least a factor of 10; therefore, the abated release rate is 3.1 E-3 Ci/yr americium-241 and 4.7 E-2 Ci/yr cesium-137, as shown in Table 1.

14.0 LOCATION OF MAXIMALLY EXPOSED INDIVIDUAL

Identify the MEI by distance and direction from the emission unit(s). The MEI is determined by considering distance, windrose data, presence of vegetable gardens, and meat or milk producing animals at unrestricted areas surrounding the emission unit.

The onsite public MEI location with respect to the 200 West Area is Laser Interferometer Gravitational Wave Observatory (LIGO). The onsite public MEI location with respect to the 200 East Area is Energy Northwest. The LIGO MEI is more restrictive than the Energy Northwest MEI; therefore, the LIGO MEI will be used for both 200 East and 200 West Areas TRU retrieval activities. This MEI is approximately 18.3 kilometers east-southeast of a release location in 200 West.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

Calculate the TEDE to the MEI using an approved procedure (see WAC 246-247-085). For each radionuclide identified in subsection(8) of this section, determine the TEDE to the MEI for existing and proposed emission controls, and without emission controls (the potential-to-emit) using the release rates from subsection (13) of this section. Provide all input data used in the calculations.

Using the unit dose factors provided in HNF-3602 and the release rates from Section 13.0, estimated potential abated and unabated TEDE to the MEI is shown in Table 1. The unabated dose from point source emissions (DVS and HVU) is 4.6 E-2 millirem per year and the abated dose is 2.3 E-5 millirem per year.

The unabated dose from diffuse and fugitive emissions from normal operations (staging/handling vented containers, installation of filters and sample ports using the Dart System, and manual excavation of contaminated soil) is 7.4 E-3 millirem per year and the abated dose is 1.5 E-3 millirem per year.

The unabated dose from diffuse and fugitive emissions from encountering deteriorated containers involving loss of containment (e.g., dropping, spilling, or puncturing a container, or otherwise encountering loss of integrity) is 6.8 E-1 millirem per year and the abated dose is 6.8 E-2 millirem per year.

16.0 COST FACTORS OF CONTROL TECHNOLOGY COMPONENTS

Provide cost factors for construction, operation, and maintenance of the proposed control technology components and system, if a BARCT or ALARACT demonstration is not submitted with the NOC.

Cost factor inclusion is not applicable because the emission controls used during the TRU retrieval activities are HEPA filtration proposed as BARCT (Section 18.0) or are defined administratively and consist of ALARA techniques.

17.0 DURATION OR LIFETIME

Provide an estimate of the lifetime for the facility process with the emission rates provided in this application.

TRU waste retrieval activities at the LLBG are scheduled to take place between August 2003 and December 2014.

18.0 STANDARDS

Indicate which of the following control technology standards have been considered and will be complied with in the design and operation of the emission unit(s) described in this application:

ASME/ANSI AG-1
ASME/ANSI N509
ASME/ANSI N510
ANSI/ASME NQA-1
40 CFR 60, Appendix A, Methods 1,1A, 2, 2A, 2C, 2D, 4,5, and 17
ANSI N13.1.

The listed control technology standards have been considered and the administratively defined ALARA based emission controls proposed for these retrieval activities are adequate to limit and control emissions.

The NucFil filters used in the TRU retrieval project are certified by the manufacturer (99.97 % removal efficiency) and have been certified by WIPP and accepted by WDOH as BARCT. The DVS and the Dart System are proposed as BARCT for drum venting operations.

The exhaust vents of the DVS have HEPA-type filtration and have test ports for annual aerosol testing. AG-1 and ANSI N509 are not applicable to a cylindrical HEPA-type filter or passive system. The system is built to meet NQA-1 requirements and will be aerosol tested annually using ANSI N-510 as guidance for non-ANSI N-509 systems. If in-field aerosol testing is not feasible, an alternative would be to rely on manufacturer certification of HEPA rating (99.97% efficiency) and replace the filters on an annual basis, in lieu of testing. There are no monitoring systems, thus the other listed standards are not applicable.

The technology standards for HVUs are addressed under the NOC for these units (DOE/RL-97-50, as amended).

Radiological surveys during and after activities and the 200 Area Near-Field Monitoring network are proposed as adequate to monitor for protection of the public and environment.

19.0 REFERENCES

02-RCA-096, letter, J. B. Hebdon, U. S. Department of Energy, Richland Operations Office, to A. W. Conklin, Washington State Department of Health, J. M. Leitch, U. S. Environmental Protection Agency, Region 10 and O. S. Wang, Washington State Department of Ecology, *DOE/RL-2001-57, Revision 1, Radioactive Air Emissions Notice of Construction for the Transuranic Waste Retrieval Project,* December 18, 2001.

DOE/RL-91-50, Rev. 3, *Environmental Monitoring Plan, United States department of Energy, Richland Operations Office*, November 2000, U.S. Department of Energy, Richland, Washington.

DOE/RL-97-50, Rev. 1, *Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emission Units*, September 1999, U.S. Department of Energy, Richland, Washington.

DOE/RL-2000-34, Rev. 1, *Radioactive Air Emissions Notice of Construction Application for the Waste Receiving and Processing Facility*, April 2001, U.S. Department of Energy, Richland, Washington.

DOE/RL-2001-32, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2000,* June 2001, U.S. Department of Energy, Richland, Washington.

HNF-2418, *Soil Contamination Standards for Protection of Personnel,* March 1998, Fluor Hanford, Richland, Washington.

HNF-3580, *Hanford Contact Handled Transuranic Drum Retrieval Project Planning Document,* November 1998, Fluor Hanford, Richland, Washington.

HNF-3602, Rev. 1, *Calculating Potential-to-Emit releases and Doses for FEMPs and NOCs,* February 2002, Fluor Hanford, Richland, Washington.

HNF-5597, *Process Description for the Retrieval of Earth-Covered Transuranic Waste Containers at the Hanford Site,* January 2000, Fluor Hanford, Richland, Washington.

HNF-7165, *Corrosion Rates and Inspection Frequencies for Steel Drums in the Hanford Site Solid Waste Burial Grounds*, August 2001, Fluor Hanford, Richland, Washington.

HNF-12180, Rev. 1, *Venting System for Low Level Burial Grounds Performance Specification,* April 2003, Fluor Hanford, Richland, Washington.

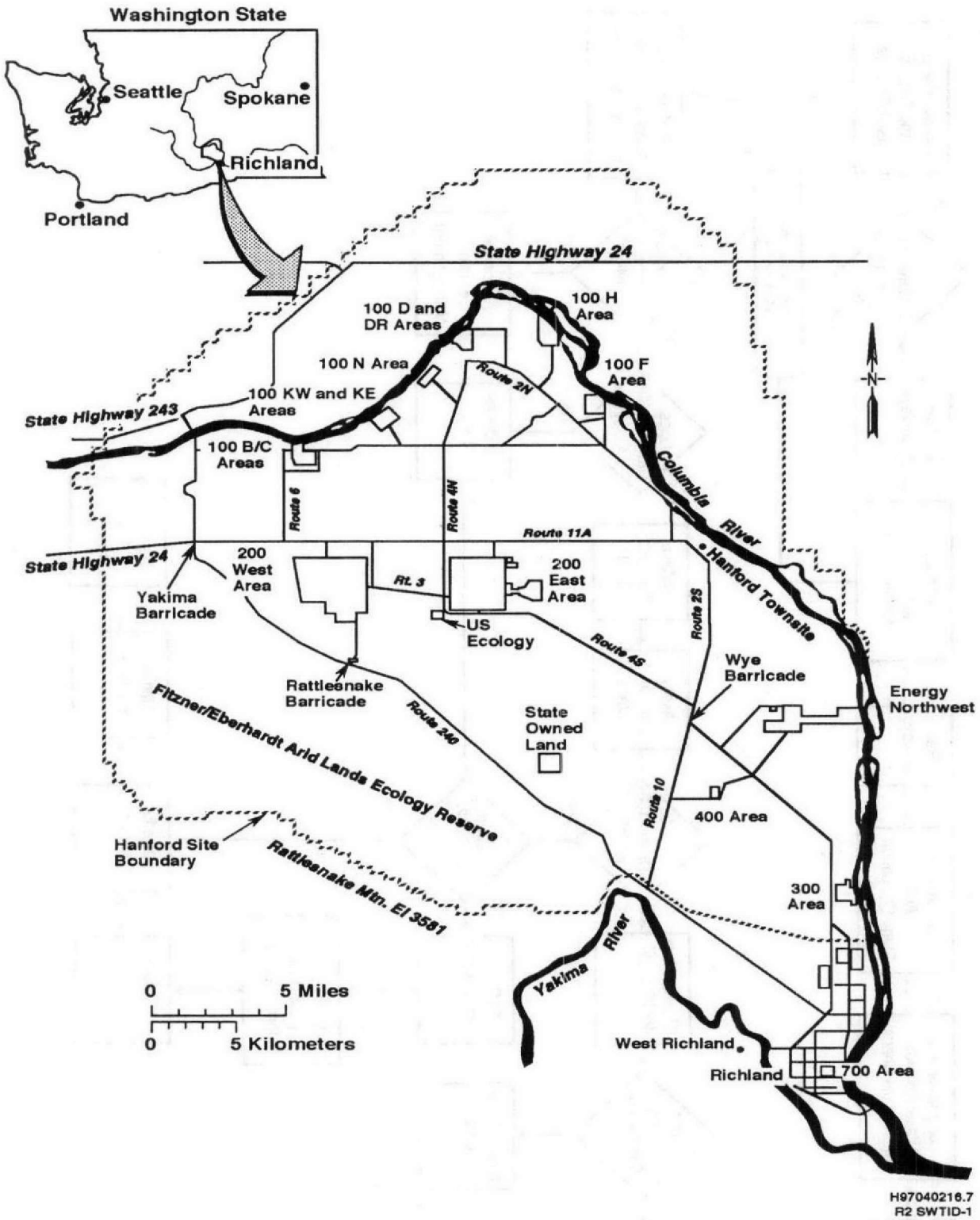


Figure 1. Hanford Site.

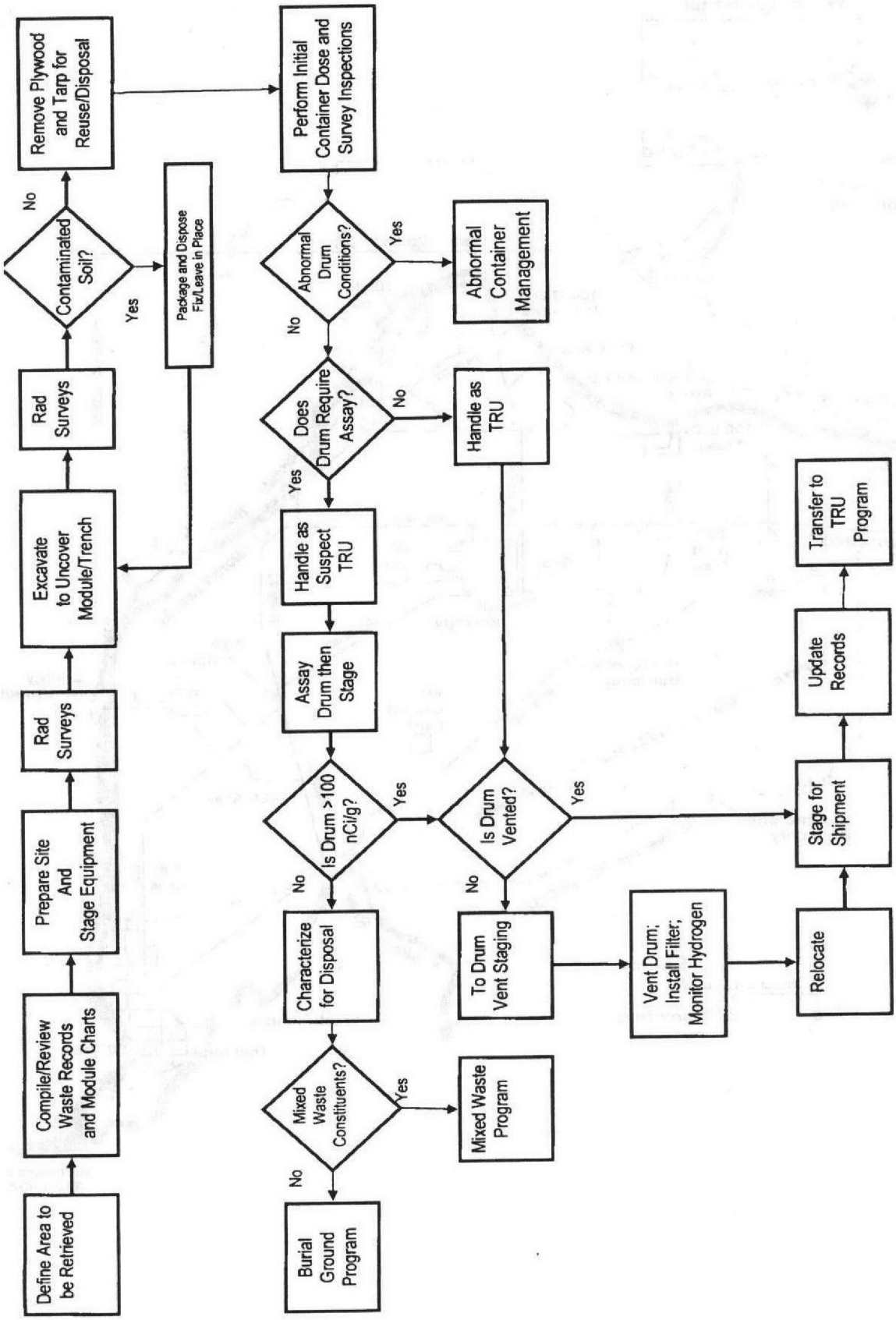


Figure 2. Simplified Transuranic Waste Retrieval Flow Diagram.

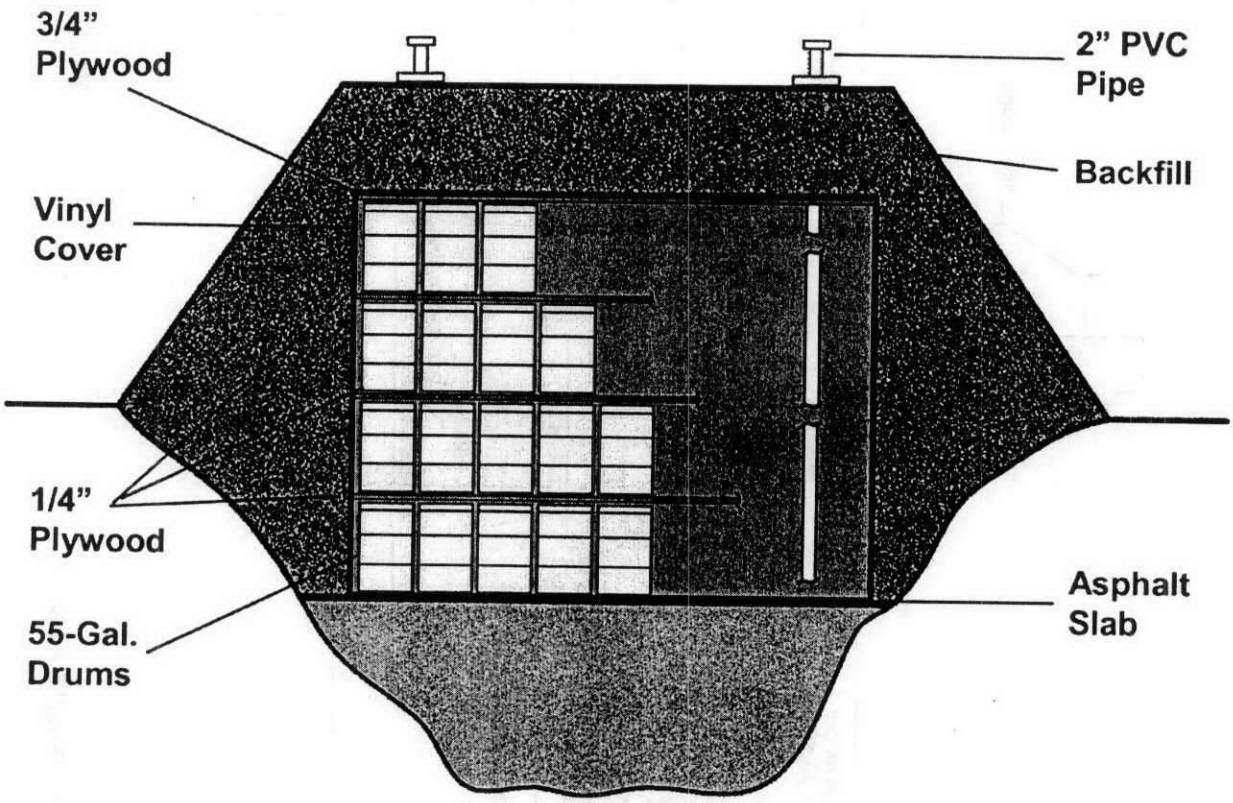


Figure 3. Typical Post-1970 Transuranic Waste Interim Storage.

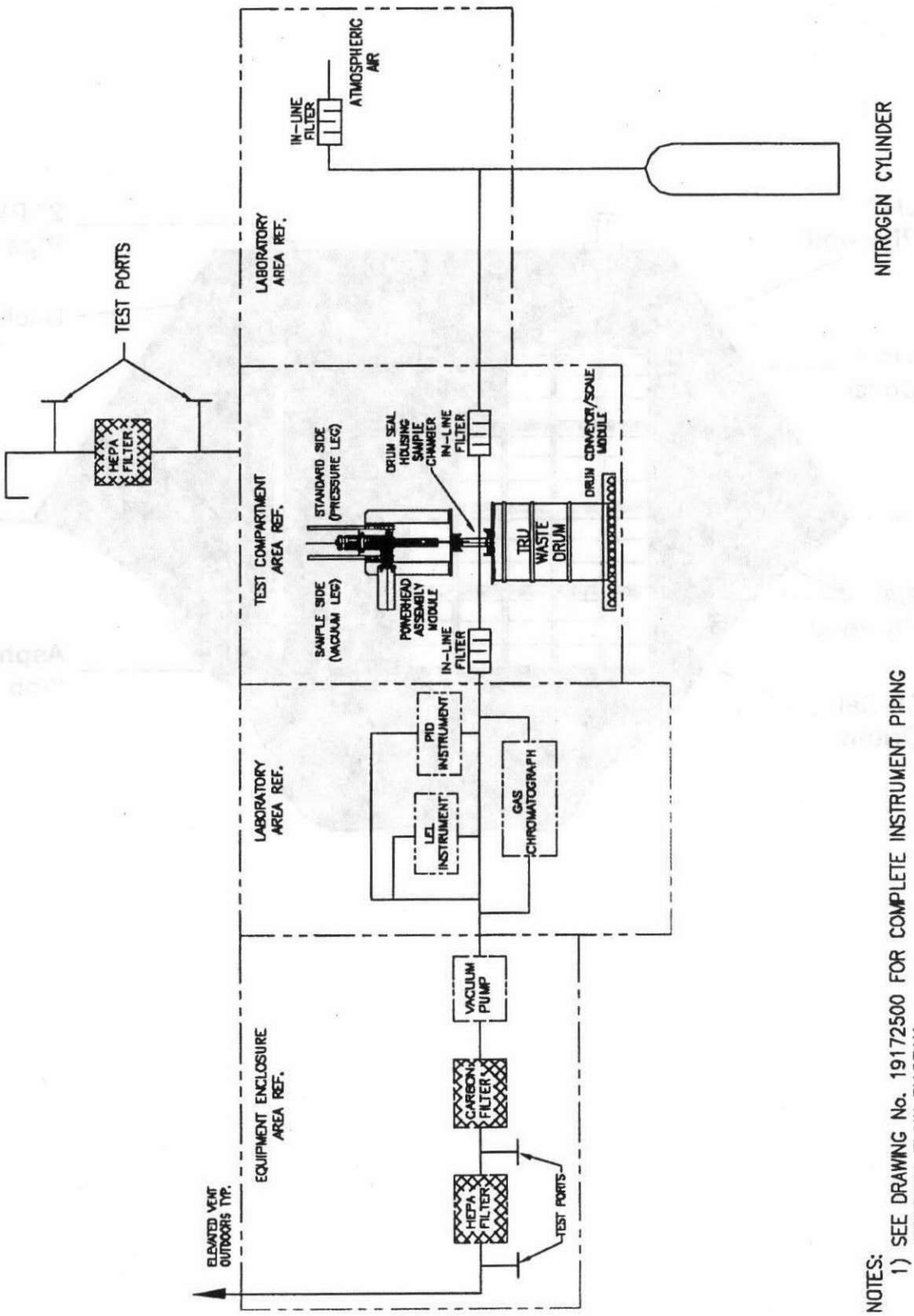


Figure 4. Simplified TRU Retrieval Drum Venting Process Flow Diagram.

Table 1. Transuranic Waste Retrieval Project Point Source and Diffuse/Fugitive Release Rates and Dose Estimates.

PTE for Diffuse/Fugitive Emissions from Staging/Handling of Vented Containers											
Radionuclide	Assumed Isotope	Average Ci/Container	Containers/ year	Estimated Inventory (Ci)		Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	1.25	11,000	1.38E+04		2.00E-09	2.8E-05	2.8E-05	1.7E+01	4.7E-04	4.7E-04
Beta Emitters	Cs-137	18.75	11,000	2.06E+05		2.00E-09	4.1E-04	4.1E-04	3.1E-01	1.3E-05	1.3E-05
Subtotal		20					4.4E-04	4.4E-04		**6.0E-04**	**6.0E-04**
PTE for Installation of NucFil Filters (Point Source DVS, Active Vent))											
Radionuclide	Assumed Isotope	Average Ci/Container	Containers/ year	Estimated Inventory (Ci)	Time Factor (containers per year * 20 min/drum)	Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	1.25	9,000	1.13E+04	3.42E-01	1.00E-03	4.3E-04	2.1E-07	1.7E+01	7.3E-03	3.6E-06
Beta Emitters	Cs-137	18.75	9,000	1.69E+05	3.42E-01	1.00E-03	6.4E-03	3.2E-06	3.1E-01	2.0E-03	9.9E-07
Subtotal		20					6.8E-03	3.4E-06		**9.3E-03**	**4.6E-06**
PTE for Installation of NucFil Filters (Point Source DVS, Passive Vent))											
Radionuclide	Assumed Isotope	Average Ci/Container	Containers/ year	Estimated Inventory (Ci)		Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	4.8E-11	9,000	4.32E-07		1.00E+00	4.3E-07	2.2E-10	1.7E+01	7.3E-06	3.7E-09
Beta Emitters	Cs-137	2.4E-09	9,000	2.16E-05		1.00E+00	2.2E-05	1.1E-08	3.1E-01	6.7E-06	3.3E-09
Subtotal							2.2E-05	1.1E-08		**1.4E-05**	**7.0E-09**
PTE for Installation of NucFil Filters (Diffuse/Fugitive Dart System)											
Radionuclide	Assumed Isotope	Average Ci/Container	Containers/ year	Estimated Inventory (Ci)	Time Factor (containers per year * 1 hr/drum)	Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	1.25	1,000	1.25E+03	1.14E-01	1.00E-03	1.4E-04	4.8E-08	1.7E+01	2.4E-03	8.1E-07
Beta Emitters	Cs-137	18.75	1,000	1.88E+04	1.14E-01	1.00E-03	2.1E-03	7.1E-07	3.1E-01	6.6E-04	2.2E-07
Subtotal		20					2.3E-03	7.6E-07		**3.1E-03**	**1.0E-06**

Table 1. Transuranic Waste Retrieval Project Point Source and Diffuse/Fugitive Release Rates and Dose Estimates (continued).

PTE for Diffuse/Fugitive Emissions from Excavation (Contamination Detected)											
Radionuclide	Assumed Isotope	Average Concentration (dpm/100 cm^2)	Estimated Soil Concentration (pCi/g)	Soil Volume (m^3/yr)	Soil Density (g/m^3)	Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	100	2.13E+02	100	1.57E+06	1.00E-03	3.3E-05	3.3E-05	1.7E+01	5.7E-04	5.7E-04
Beta Emitters	Cs-137	5,000	1.41E+03	100	1.57E+06	1.00E-03	2.2E-04	2.2E-04	3.1E-01	6.9E-05	6.9E-05
Subtotal							2.5E-04	2.5E-04		6.4E-04	6.4E-04
PTE for Diffuse/Fugitive Emissions from Excavation (Higher Contamination Level, Controls Required)											
Radionuclide	Assumed Isotope	Average Concentration (dpm/ 100 cm^2)	Estimated Soil Concentration (pCi/g)	Soil Volume (m^3/yr)	Soil Density (g/m^3)	Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	2,000	4.26E+03	10	1.57E+06	1.00E-03	6.7E-05	6.7E-06	1.7E+01	1.1E-03	1.1E-04
Beta Emitters	Cs-137	100,000	2.82E+04	10	1.57E+06	1.00E-03	4.4E-04	4.4E-05	3.1E-01	1.4E-04	1.4E-05
							5.1E-04	5.1E-05		1.3E-03	1.3E-04
Subtotal											
PTE for Diffuse/Fugitive Emissions from Excavation (Notification Level)											
Radionuclide	Assumed Isotope	Average Concentration (dpm/ 100 cm^2)	Estimated Soil Concentration (pCi/g)	Soil Volume (m^3/yr)	Soil Density (g/m^3)	Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	28,000	5.96E+04	1	1.57E+06	1.00E-03	9.4E-05	9.4E-06	1.7E+01	1.6E-03	1.6E-04
Beta Emitters	Cs-137	500,000	3.95E+05	1	1.57E+06	1.00E-03	6.2E-04	6.2E-05	3.1E-01	1.9E-04	1.9E-05
Subtotal							7.1E-04	7.1E-05		1.8E-03	1.8E-04
Manual Excavation Summary											
Alpha Emitters	Am-241					1.00E-03	1.9E-04	4.9E-05	1.7E+01	3.3E-03	8.4E-04
Beta Emitters	Cs-137					1.00E-03	1.3E-03	3.3E-04	3.1E-01	4.0E-04	1.0E-04
Manual Excavation Diffuse/Fugitive Subtotal										**3.7E-03**	**9.4E-04**
HVU Use Point Source (1% of Manual Excavation Subtotal)											
Alpha Emitters	Am-241					1.00E+00	1.9E-03	9.7E-07	1.7E+01	3.3E-02	1.6E-05
Beta Emitters	Cs-137					1.00E+00	1.3E-02	6.4E-06	3.1E-01	4.0E-03	2.0E-06
HVU Use Subtotal										**3.7 E-02**	**1.8E-05**

Table 1. Transuranic Waste Retrieval Project Point Source and Diffuse/Fugitive Release Rates and Dose Estimates (continued).

PTE for Fugitive Emissions from Encountering Loss of Containment (Handling Mishaps with Loss of Integrity)											
Radionuclide	Assumed Isotope	Average Ci/Container	Containers/ year	Estimated Inventory (Ci)		Release Fraction	Unabated Release Rate (Ci/yr)	Abated Release Rate (Ci/yr)	Unit Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Alpha Emitters	Am-241	1.25	25	3.13E+01		1.00E-03	3.1E-02	3.1E-03	1.7E+01	5.3E-01	5.3E-02
Beta Emitters	Cs-137	18.75	25	4.69E+02		1.00E-03	4.7E-01	4.7E-02	3.1E-01	1.5E-01	1.5E-02
Subtotal		20					2.0E-01	2.0E-02		**6.8E-01**	**6.8E-02**

PTE Summary	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)
Total Point Source Emissions (DVS and HVUs)	**4.6E-02**	**2.3E-05**
Total Diffuse and Fugitive (Normal Operations from Staging, Dart System, and Manual Excavation)	**7.4E-03**	**1.5E-03**
Total Diffuse and Fugitive (Encountering Containers with Loss of Containment)	**6.8E-01**	**6.8E-02**

Legend for Table 1:

Ci	= curie(s).
Ci/yr	= curies per year.
dpm/100 cm^2	= disintegrations per minute per 100 square centimeters.
DVS	= drum venting system
g	= gram.
hr`	= hour.
HEPA	high-efficiency particulate air (filter)
HVU	HEPA-filtered Vacuum Unit
m^3	= cubic meters.
mrem/Ci	= millirem per curie.
mrem/yr	= millirem per year.
pCi/g	= picocuries per gram.
PTE	= potential-to-emit.
yr	= year.

This page intentionally left blank.

DISTRIBUTION

MSIN

J. KenKnight
United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington, 98101

A. W. Conklin
Washington State Department of Health
7171 Cleanwater Lane, Building 5
Olympia, Washington 98504

J. W. Schmidt
Washington State Department of Health
Division of Radiation Protection
Air Emissions and Defense Waste
309 Bradley Blvd., Suite 201
Richland, WA 99352

Dirk A. Dunning
Oregon Office of Energy
625 Marrian Street N.E., Suite 1
Salem, OR 97301-3742

J. Van Pelt
Confederated Tribes of the Umatilla Indian Reservation
P. O. Box 638
Pendleton, Oregon 97801

P. Sobotta
Nez Perce Tribe
P. O. Box 365
Lapwai, Idaho 83540

R. Jim, Manager
Environmental Restoration/Waste Management Program Yakama Nation
P. O. Box 151
Toppenish, Washington 98948

U.S. Department of Energy, Richland Operations Office

M. S. Collins	H0-12
M. S. French	A4-79
R. F. Guercia	A6-38
M. F. Jarvis	A5-15
E. M. Mattlin	A5-15
G. H. Sanders	H0-12
T. A. Shrader	A6-38
P. J. Valcich	T3-28
Public Reading Room	H2-53

DISTRIBUTION

	MSIN
Fluor Hanford	
J. A. Bates	N1-25
P. B. Brannan	T4-04
M. A. Cahill	T4-04
R. H. Engelmann	N1-25
D. E. Faulk	T4-04
R. D. Greenwell	T4-04
R. H. Gurske	H8-73
J. E. Hyatt	N1-24
M. T. Jansky	N1-25
R. E. Johnson (5)	N1-25
K. M. McDonald	H8-44
D. G. Saueressig (2)	T4-04
K. R. Welsch	N1-25
J. F. Williams	N1-25
AOP File	N1-25
Pacific Northwest National Laboratory	
Hanford Technical Library	P8-55
Lockheed Martin Information Technology	
Central Files	B1-07
DPC	H6-08
EDMC (2)	H6-08